

a nymph, a stage roughly corresponding with chrysalis of a butterfly. This nymph, if it has luck, again attaches itself to the dog and has a meal, but it also fails to infect the dog. After a varying time it also drops to the ground, undergoes a metamorphosis, and gives rise to the eight-legged adult tick. Here at last we reach the infective stage; the adult tick is alone capable of giving the disease to the animal upon which she feeds, and then only when she is descended from a tick which has bitten an infested host. Think what a life-history this parasite has! Living in the blood-corpuscles of a dog, sucked up by an adult tick, passed through her body until it reaches an egg, laid with that egg, being present while the egg segments and slowly develops into the larva; living quiescent during the larval stage and the nymph stage, surviving the metamorphosis, and only leaping into activity when the adult stage is reached. This most remarkable story probably indicates that the *Piroplasma* undergoes a series of changes comparable to those of the malaria organism when it is inside the mosquito; what these stages are we do not at present know, but Dr. Nuttall and Mr. Smedley at Cambridge, and many other observers elsewhere, are at work on the problem, and soon we shall have more light.

With regard to bovine piroplasmiasis, Koch and others have distinguished redwater fever, which is conveyed by *Rhipicephalus annulatus*, and in Europe probably by *Ixodes reduvius* from the Rhodesian fever which is conveyed by *Rhipicephalus appendiculatus*, and I regret to say by a species dedicated to myself, *Rhipicephalus shipleyi*.<sup>1</sup>

The heartwater disease of sheep and goats is similarly conveyed by *Amblyomma hebraeum*, the Bont tick, and many farmers accuse *Ixodes pilosus* of causing the well known paralysis from which sheep suffer in the early autumn; and there are many others, diseases such as the chicken disease of Brazil, which is so fatal to poultry yards, and which is conveyed by the *Argas persicus*.

I will not weary you with more diseases. I think I have said enough to show that within the last few years a flood of light has been thrown upon diseases, not only of man and his domestic animals, but upon such insignificant creatures as the mosquito and the tick. I have tried to show how these diseases interact, and how both hosts are absolutely essential to the disease. We can now to a great extent control these troubles; the old idea that there is something unhealthy in the climate of the tropics is giving way to the idea that the unhealthiness is due to definite organisms conveyed into man by definite biting insects. We have at last, I think, an explanation of why Beelzebub was called the Lord of Flies.

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—Prof. Osler has been nominated by the Vice-Chancellor and Proctors as a delegate of the University Press.

A decree has been approved by Convocation providing that the stipend of the Sibthorpe professor of rural economy shall be 600*l.* a year, independently of the income from the Sibthorpe estate, in the years 1906 and 1907. This is necessary if an election is to be made before 1908, as the full endowment will not be provided by St. John's College until that year. St. John's is to nominate a member of the board of electors to the chair.

The following elections have been made to scholarships and exhibitions in natural science:—Balliol College, to a Brakenbury scholarship, J. S. Huxley (Eton College); to a scholarship, C. Whitley (Bromsgrove School); Lincoln College, to a scholarship, P. Pickford (Exeter School); to an exhibition, E. Hancock (Exeter School); Magdalen College, to a demyship, D. L. Hammick (Whitgift Grammar School, Croydon); to an exhibition, J. F. Venables (Magdalen College School, Oxford); Christ Church, to a scholarship, J. T. Lattey (Dulwich College); to an exhibition, W. A. Akers (Aldenharn School); Trinity College, to a Millard scholarship, H. G. J. Moseley (Eton College).

A COURSE of lectures upon modern research in the psychology of memory, accompanied by the exhibition of

<sup>1</sup> This happily turns out to be a synonym.

apparatus, will be given by Dr. C. S. Myers in the physiological theatre of King's College, London, on January 12 and the following seven Fridays at 6 p.m. The course is free to internal students of the university and to all teachers. The general course in experimental psychology, accompanied by laboratory work, will be held on Saturdays, beginning on January 13. Particulars may be obtained from the secretary of the college.

THE *London University Gazette* announces that a course of nine or ten lectures on the origin of Gymnosperms will be given during the Lent term by Prof. F. W. Oliver, F.R.S., at University College on Mondays, commencing on January 22. There is no fee for the lectures. Further details and cards of admission may be obtained on application to the academic registrar at the university. Two courses of lectures have been arranged for the Lent term in the physiological laboratory of the university, viz. eight lectures on tissue-respiration by Mr. J. Barcroft on Tuesdays, beginning on January 16, and eight lectures on respiration by Dr. M. S. Pembrey on Fridays, beginning on January 19.

### SOCIETIES AND ACADEMIES.

#### LONDON.

Royal Society, November 23, 1905.—“Some Observations on *Welwitschia mirabilis*, Hooker, f. By Prof. H. H. W. Pearson. Communicated by A. C. Seward, F.R.S.

Evidence is adduced in support of the view that *Welwitschia* is partially, if not entirely, insect-pollinated, and that the processes of fertilisation and maturation of the seed seem to be effected much more rapidly than in other Gymnosperms.

The author supports Strasburger's view that the male flowers are reduced forms of an originally hermaphrodite structure. The nature of the prothallial tubes is discussed, and the conclusion is that the true interpretation of the extraordinary behaviour of the fertile end of the *Welwitschia* prothallus will be founded upon a comparison with the corresponding portion of the embryo-sac of *Gnetum gnemon*.

December 14, 1905.—“The Araucariæ, Recent and Extinct.” By A. C. Seward, F.R.S., and Sibille O. Ford.

The work was undertaken primarily with a view to ascertain whether the genera *Agathis* and *Araucaria* exhibit any of those features which are often associated with survivals from the past; the aim was to obtain an answer to the question: Do the existing Araucariæ afford evidence of primitive characters or do they throw light on the phylogeny of the araucarian phylum?

A comparison is made between the Araucariæ and Lycopodiales; arguments are advanced in favour of the view that this group of Gymnosperms, unlike the Cycadales, was probably derived from lycopodiaceous ancestors. Attention is directed to the various characters in which the Araucariæ differ from other members of the Coniferales, and the advisability is suggested of giving more definite expression to their somewhat isolated position by substituting the designation Araucariales for Araucariæ.

The authors contend that the general consent which has deservedly been given to the view that the Cycadales and Filicales are intimately connected by descent may have the effect of inducing an attitude too prone to overestimate the value of the arguments advanced in support of an extension of the idea of a filicinean ancestry to other sections of the Gymnosperms.

“On the Microsporangia of the Pteridosperms.” By R. Kidston, F.R.S.

The conclusion arrived at is that the Cycadofilices, which long antedated the advent of true ferns, cannot have been derived from them, but are themselves the oldest type of fern-like plant at present known. In regard to the true ferns, it seems probable that they may have been derived from the Botryopterideæ.

“The Mammalian Cerebral Cortex, with Special Reference to its Comparative Histology. I., Order Insectivora.” By Dr. G. A. Watson. Communicated by Dr. F. W. Mott, F.R.S.

This paper is one of a series in which it is hoped to deal with the cerebral cortex of the various orders of mammals so far as material is available, the primary object of the research being to endeavour to shed some further light upon the significance of the mammalian neopallial lamination. In this natural order the brains of the mole (*Talpa europæa*), shrew (*Sorex vulgaris*), and hedgehog (*Erinaceus europæus*) have been exhaustively studied.

The neopallium of these animals has been mapped out into various areas, which on the dorso-lateral and mesial aspects appear to present (1) "motor," (2) general sensory, and (3) undifferentiated or unspecialised characteristics, the two former being in every way the best developed neopallial regions. On the postero-mesial aspect a field has been delimited which possesses sensory features; a portion of this is unspecialised, and the remainder is believed to represent the cortical distribution of the optic and fifth sensory nerves respectively. Certain differences in the extent and state of development of these various areas occur in the several animals, and these agree with certain differences in their habits.

The total depth of the cortex in the best developed regions differs in the three animals, yet the relative depth of the separate layers is about the same in all. Micrometric measurements of the cortex of the mole have been made by Dr. Bolton, and these have been compared with the latter's measurements of the cortical layers in the developing human foetus and the normal human adult. Dividing the cortex into the portions above and below the granular layer, it is found that the increase in depth of the human cortex as compared with that, say, of the mole is very largely due to increase in the "supra-granular" (i.e. the true pyramidal) layer.

The conclusions as to the functional significance of the neopallial primary cell layers in the Insectivora and in mammals belonging to other natural orders so far examined form a complement to those advanced by Bolton. The "infra-granular" layer (iv. and v.), omitting the constituent cells which possess motor or analogous functions, is concerned especially with the associations necessary for the performance of the instinctive activities, the "supra-granular" (ii.) with the higher associations ("intelligence"), the capacity for which is shown by the educability of the animal. In practical animal behaviour the two sets of processes are probably more or less constantly interwoven, the higher activities (supra-granular layer) coming to the aid of the lower so far as the capability of the animal allows. In the case of lower mammals, e.g. Insectivora, the limits of this capability are comparatively soon reached, and correspondingly these mammals possess a relatively poor "supra-granular" layer.

**Anthropological Institute, December 19, 1905.**—Prof. W. Gowland, president, in the chair.—The origin of Eolithic flints from natural causes: S. H. **Warren**. Mr. Warren classified eoliths as follows:—(1) Flints with battered surfaces formed by prolonged concussions; (2) flints with flake surfaces formed by sharp percussions; (3) flints with chipped edges formed by (a) indiscriminate battering, (b) perpendicular pressure. The possible causes of the production of eoliths were considered by Mr. Warren to be:—(a) human agency; (b) wave action; (c) water abrasion by streams, rivers, floods; (d) soil abrasion by the pressure and movement of soil creep and foundering; (e) the drag of ice; and (f) wear and tear on the surface of the ground. The eoliths of the first class, as defined above, may obviously be due to water abrasion. Those of the second class bear evidences of percussion-flaking, acting along the lines of least resistance, but show no control-working upon a definite design. It is concluded that these forms, together with those having indiscriminately battered edges, are likewise due to water abrasion. It is noteworthy that these classes are characteristic of river gravels of various ages, and may be reproduced by artificial rolling. The flints with definitely pressure-chipped edges include the typical "plateau implements" of Sir J. Prestwich. The chief forms are a general chipped edge, and the notch, either single or in various combinations, such as the double notch with intervening point. It is found by experiment that these are the forms produced by the fortuitous pressure of one flint against another. The angle of chipping and

the type of the fractures are also identical in the case of the experimental productions and the plateau flints. These pressure-chipped eoliths are characteristic of hill-drifts which have suffered from the movement of soil-creep and foundering, and it is concluded that this is the cause of the chipped edges. This process is named "soil abrasion" in contradistinction to water abrasion. Collateral evidence of these differential soil movements under pressure is furnished by the frequent association with the eoliths of the hill-drifts of flints with surfaces striated in all directions. Subsidiary causes of the pressure-chipped eoliths, or those which have operated in certain special cases, are the drag of ice and wear and tear on the surface of the ground, including the impact of the hoofs of animals.

#### EDINBURGH.

**Royal Society, December 4, 1905.**—Lord Kelvin, president, in the chair.—The development of the skull and visceral arches in *Lepidosiren*: W. E. **Agar**. The material for this investigation had been collected by Prof. Graham Kerr in the Chaco, and by the late Mr. J. S. Budgett in the Gambia. The chief points established were as follows:—The development of the notochord underwent a curious modification, the front end disintegrating at an early stage and being replaced by a forward growth of the remaining part of the chorda. The quadrate was from the first continuous with the trabecula, and there was no hyomandibular. A vestigial palato-pterygoid bar was present. The general development of the skull resembled the process in the Urodeles, especially as regards the occipital region and nasal capsules. There were two pairs of upper labial cartilages. In the change from the larval to the adult form there was no absorption of cartilage, but the chondrocranium showed a steady increase in completeness. —Perturbations in longitude of Neptune by the hypothetical planet: Prof. George **Forbes**, F.R.S. About twenty-five years ago the author had deduced evidence from the distribution of the aphelia of cometary orbits that there existed a planet of considerable mass beyond the orbit of Neptune, and the existence of such a planet was now generally accepted by astronomers. In the present paper, by means of calculations based upon certain assumptions as to position and mass of the hypothetical planet, Prof. Forbes discussed the growing discrepancies between the observed longitudes of Neptune and those assigned by the theories both of Leverrier and Newcomb. The present configuration of the two planets was not the best to bring out clearly the nature of the perturbation, but he thought that in ten years sufficient material would be in hand to enable us to make a serious effort to fix the position of the ultra-Neptunian planet.—Exhibition of two lantern slides of zoological interest: Prof. D. J. **Cunningham**, F.R.S. The one showed a group of monkeys in the Dublin Zoological Gardens sitting in newly fallen snow without the least discomfort; from the beginning of their captivity they had lived in the open air. The other showed a young marmoset clinging in its peculiar fashion to the back of a white rabbit which had acted as foster-mother from the start of the marmoset's individual life.

**December 18, 1905.**—Dr. R. H. Traquair, F.R.S., vice-president, in the chair.—Library aids to mathematical research: Dr. Thomas **Muir**, F.R.S. After a critical discussion of the various bibliographical aids to the mathematical student, the author proceeded to point out the shortcomings in the equipment of the most important scientific libraries in Edinburgh and Glasgow. Out of sixty-seven important mathematical serials, only thirty-four were to be found in Edinburgh and Glasgow; and of the thirty-one to be found in Edinburgh, twenty-one were duplicated in the university and Royal Society libraries. Dr. Muir hoped that by some system of cooperation between the Edinburgh libraries, or even between Edinburgh and Glasgow, every mathematical serial published in Europe and America would be made available to mathematical workers. At present historical research was absolutely debarred.—Preliminary note regarding an experimental investigation into the effects of varying diets upon growth and nutrition: Dr. Chalmers **Watson**. The experiments consisted in feeding colonies of rats upon various diets, namely, (1) skim milk and bread; (2) rice;



(3) porridge; (4) horse flesh; (5) ox flesh. Interesting details were given and illustrated by diagrams and tables. The rats were found to thrive best on the skim milk and bread. Rice, because of its lack of proteid qualities, stunted the growth. Porridge was inferior to the skim milk and bread, while horse flesh and ox flesh were positively deleterious; being fatal to young rats. Moreover, the mortality among the young was greatly increased when the adult parents were fed on flesh. Experiments were also tried on the effects of change of diet. For example, after the young rats had been reduced almost to starvation point by a flesh diet, they were put on milk and bread, and immediately began to recover, and rapidly reached the maximum growth. In this set of experiments it was found that sweet milk and bread were inferior as a recuperative diet to skim milk and bread. Prof. Schäfer, in whose laboratory the experiments had been carried out, referred to the importance of the research in relation to physical deterioration. Although it would be absurd to apply the results directly to the question of human diets and nutrition, there was no doubt that the physical deterioration so much spoken about was due, not only to underfeeding, but to wrong feeding. So far as the public was concerned, the moral was that we must feed our children correctly.

#### NEW SOUTH WALES.

**Royal Society, October 4, 1905.**—Mr. H. A. Lenahan, president, in the chair.—Note on some simple models for use in the teaching of elementary crystallography: Dr. W. C. **Woolnough**. The models illustrated the connection between the number of faces in a crystal "form" and the elements of symmetry of the group to which the crystal belongs. Planes of symmetry are represented in the models by mirrors suitably arranged, and crystal faces by triangles of cardboard. The mirrors are so fixed that the multiple reflection of the card reproduces the shape of the most general form possible in the crystal group.

November 1, 1905.—Mr. H. A. Lenahan, president, in the chair.—Provisional determination of astronomical refraction, from observations made with the meridian circle instrument of the Sydney Observatory: C. J. **Merfield**. This paper gives the results of an investigation into astronomical refraction, deduced from some five hundred and fifty observations of forty fundamental stars taken with the meridian circle of the Sydney Observatory during the month of July, 1905. The conclusions arrived at by the author are as follows:—That if observations of zenith distance of celestial objects are taken between limits of time separated by some hours, then greater accuracy in the reductions, to obtain correct positions, can be obtained by taking fully into consideration the fluctuations of the height of the barometer, and especially the variation of the temperature, indicated by the readings of the thermometer, when computing the refractions for a series of observations extending over a period of several hours' duration. Adopting a state of the atmosphere for a mean of the times of observation does not seem sufficient. Further, the refraction table (Bessel) in use at the Sydney Observatory would represent the observed refractions much better if a correction be applied for the difference in the force of gravity at Greenwich and Sydney. This correction is represented by a very simple equation which is a function of the latitudes of the two places. The author also considers that the refractions computed from the Pulkowa tables, after applying the gravity correction, would represent the observed values better than those of Bessel.

#### DIARY OF SOCIETIES.

##### THURSDAY, JANUARY 4.

**RÖNTGEN SOCIETY**, at 8.15.—Presidential address: The Present Position of Radio-activity: Prof. F. Soddy.

**CIVIL AND MECHANICAL ENGINEERS' SOCIETY**, at 8.—The Present Position of the Sewage Question: J. F. Reade.

##### FRIDAY, JANUARY 5.

**GEOLOGISTS' ASSOCIATION**, at 8.—On the Geology of the Country around the Sogne Fjord and the Hardanger Fjord, Norway: H. W. Monckton.

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##### MONDAY, JANUARY 8.

**SOCIETY OF CHEMICAL INDUSTRY**, at 8.—Cinchona Barks and their Cultivation: D. Howard.—A New Method for the Quantitative Estimation of Acetone: S. J. M. Auld.

##### TUESDAY, JANUARY 9.

**INSTITUTION OF CIVIL ENGINEERS**, at 8.—The Elimination of Storm-water from Sewerage Systems: D. E. Lloyd-Davies.—On the Elimination of Suspended Solids and Colloidal Matters from Sewage: Lieut.-Colonel A. S. Jones and Dr. W. O. Travis.

##### WEDNESDAY, JANUARY 10.

**GEOLOGICAL SOCIETY**, at 8.—The Clay-with-Flints: its Origin and Distribution: A. J. Jukes-Browne.—On Footprints from the Permian of Mansfield (Nottinghamshire): G. Hickling.

##### THURSDAY, JANUARY 11.

**INSTITUTION OF ELECTRICAL ENGINEERS**, at 8.—The Charing Cross Company's City of London Works: W. H. Patchell (*Conclusion of Discussion*).

**LONDON MATHEMATICAL SOCIETY**, at 5.30.—On the Diffraction of Sound by Large Cylinders: J. W. Nicholson.—On the Monogeneity of an Algebraic Function: Dr. H. F. Baker.

##### FRIDAY, JANUARY 12.

**ROYAL ASTRONOMICAL SOCIETY**, at 5.

**INSTITUTION OF CIVIL ENGINEERS**, at 8.—Lecture on the Theory of Machines: Prof. J. D. Cornack.

**MALACOLOGICAL SOCIETY**, at 8.—Note of the Dates of Publication of C. L. F. von Sandberger's "Die Land- und Süßwasser-conchylien der Vorwelt," 1870-75: B. B. Woodward.—New Species of Siphonaria, Terebra, and Maugilia, and a Remarkable Form of *Cypraea cruenta*, from South Africa: G. B. Sowerby.—Remarks on some Forms of Chloritis with Description of a New Species: G. K. Gude.—Notes on the Anatomy of S. African Aplysiidae with Descriptions of two New Species: R. H. Burne.—Notes on *Voluta kenyoniana*, *V. papillosa*, var. *costata*, *V. roadeni*, juv., *Cypraea tigris*, var. *lineata*, and *Conus waterhousei*, var. *mauritiana*: Mrs. Kenyon.—Description of a New Species of Crepidula from Victoria: Mrs. Kenyon.

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